Winters

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FOREST RESOURCES OF THE SOUTH LOUISIANA DELTA

by

R. K. Winters, Forester

A Progress Report by

THE SOUTHERN FOREST SURVEY

I. F. Eldredge, Regional Survey Director

SOUTHERN FOREST EXPERIMENT STATION

E. L. Demmon, Director

New Orleans, La.

FOREWORD

The Forest Survey, which is a part of the United States Forest Service, was authorized by the McSweeney-McNary Forest Research Act of 1928 to make a nation-wide study of our forest resources. The five-fold object of this study is: (1) to make an inventory of the present supply of timber and other forest products, (2) to ascertain the rate at which this supply is being increased through growth, (3) to determine the rate at which this supply is being diminished through industrial and local use, windfall, fire, and disease, (4) to determine the present requirement and the probable future trend in the requirement for timber and other forest products, and (5) to correlate these findings with existing and anticipated economic conditions, in order that policies may be formulated for the effective use of lands suitable for forest production.

This release is based on a field survey made October 1934 to March 1935 and on two field canvasses of forest industrial plants to determine forest drain, the last of which was completed during March 1938. It should be regarded only as a progress report since it contains Forest Survey data that will be included in complete reports to be published later, and that, although considered reliable, are subject to correction or amplification as the work of computation proceeds. Item 4 above, which is being studied on a national basis, is not discussed in this report.

In the interpretation of these data, it must be noted that owing to the sampling method used in collecting them, the greater the number of samples in any given classification the more accurate are the data for that classification. Hence classes that are of infrequent occurrence and relatively small in quantity generally cannot be determined with as high a degree of accuracy as classes that occur more frequently and in substantially greater quantities. Small tabular items are to be taken as showing, not the exact magnitude of the classes involved, but their relative magnitude in comparison with those of other classes.

In the South, the Forest Survey functions as an activity of the Southern Forest Experiment Station with headquarters at New Orleans, La.

Assisting Staff

J. A. Putnam, Associate Forest Economist, In Charge of Field Work
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Note: Assistance in the preparation of these materials was furnished by the personnel of Works Progress Administration Official Projects 701-3-9 and 365-64-3-7.

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UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

Masonic Temple,
333 St. Charles St.,
New Orleans, La.,
March 8, 1939

Reports
Forest Survey Release No. 42

Dear Sir:

I am very glad to enclose a copy of Forest Survey Release No. 42, "Forest Resources of the South Louisiana Delta," by R. K. Winters of the staff of the Southern Forest Survey.

In consideration of the increased interest throughout the South in the manufacture of newsprint from southern hardwoods, this report, showing a very large supply of tupelo gum pulpwood is particularly timely. The rapidly developing oil production in this part of the State is bringing a substantial immediate cash return to owners of land bearing immature forests, thus making possible an integrated use of land for forest and oil production. Although less than one-third of the gross land area of this large Survey unit is occupied by forest growth, the timber stands are on highly productive forest soils which, unlike those of other sections of the Mississippi Delta, do not in the main seem destined for future agricultural use. The author points out that "The opportunity for developing excellent stands of fast-growing, high-quality hardwood trees, along with the favorable location for future markets, indicates that the management of privately owned forest land for continuous crops of timber has excellent chances for success."

It is hoped that you will find this report interesting and useful. If you desire them, additional copies will be sent upon request.

Very truly yours,

E. L. DEMMON, Director,

By I. F. Eldredge
I. F. Eldredge,
Regional Survey Director.

FOREST RESOURCES OF THE SOUTH LOUISIANA DELTA

Location and General Description

The South Louisiana Delta Survey Unit includes the flood-plains of the Mississippi River in south Louisiana and the adjoining hardwood areas; it thus includes all or parts of 31 parishes 1/ lying south of the Red River below the city of Alexandria, as shown in figure 1. The outstanding physiographic subdivisions of the unit are: the better-drained flood plains of the Mississippi River; an extensive nonalluvial coastal marsh along the Gulf of Mexico; a natural prairie west of Opelousas and Lafayette almost entirely agricultural, with the forest confined to narrow belts of pine and hardwood along the streams; and timbered swamps in the Grand Lake area and to the west and south of Lakes Pontchartrain and Maurepas (fig. 1).

Much of the land area suited for agricultural use is being cropped. A strip of land along the west bank of the Mississippi between New Orleans and Baton Rouge is largely in sugarcane production, as is also the Bayou LaFourche country from Donaldsonville southward and the land near Bayou Teche. The prairie country is largely devoted to rice production and the beef-cattle industry associated with it. Elsewhere in the unit, cotton, along with some corn, is produced, while in a few areas specialized truck crops are raised.

During the past few years the rapidly developing oil industry has become a very important source of wealth, particularly in the south portion of the unit. Trapping and fishing, together with the sulphur and salt industries, all restricted largely to the coastal region, contribute materially to the economic life of the unit. New Orleans, Baton Rouge, Alexandria, and Lafayette are the principal cities and the only ones with a population of more than 10,000 in 1930.

Table 1 shows that the total land area of the unit, 11.5 million acres, is approximately one-third forest, one-third agricultural land, and one-third land in other uses. Of this latter, nearly all is in coastal marshes along the Gulf of Mexico.

With the exception of the natural prairies in the western part of the unit and the coastal marshes, practically all of this unit was originally covered with a dense stand of hardwood or cypress timber. Since earliest Colonial times, cypress and, to a less extent, hardwoods have been cut into lumber for local building and export. Until the beginning of the twentieth century, cypress logging was largely accomplished by floating accessible timber to sawmills near a local market. New Orleans and the cities of south-central Louisiana were chiefly built of cypress from nearby sloughs and the larger swamps in the vicinity of Grand Lake and Lakes Pontchartrain and Maurepas. Near the end of the past century, as southern cypress became an important item on the national lumber market, large efficient cypress mills were established at or near New Orleans, Franklin, Jeanerette, and Plaquemine; and during the second decade of the present century, as southern hardwood lumber came to fill an increasingly important place in the national market, hardwood lumber production in this unit accelerated sharply.

1/ Parishes in Louisiana are the equivalent of counties.

Table 1. - Land area classified according to major uses, 1935

Land use	Total land area	
	Acres	Percent
Forest	3,735,400	32.6
Agricultural:		
In cultivation:		
Old cropland	3,141,700	27.4
New cropland	44,500	.4
Out of cultivation:		
Idle	163,300	1.4
Abandoned	55,000	.5
Improved pasture	302,900	2.6
Total agricultural	3,707,400	32.3
Other:		
Marsh 1/	3,813,100	33.2
Nonmeandered waterways, towns, villages, roads, railroads, etc.	219,000	1.9
Total other	4,032,100	35.1
Total land area	11,474,900	100.0

1/ Includes a negligible area of prairie.

Owing to the relatively large area in marsh and in cypress-tupelo gum swamps, and to the fact that the area of cropland in this unit is practically stable, it is not anticipated that there will be any large-scale conversion of forest to cropland in the immediate future. The situation in regard to the forest area is shown in greater detail in table 2, where this area is classified into ten forest types on the basis of the species found there and into five forest conditions on the basis of the character of the timber stand. The areas in which certain forest types predominate are shown in figure 1. The red gum-water oak, hackberry-elm-ash, water oak, and cottonwood-willow types of table 2 have been combined in figure 1 into the red gum-mixed hardwood type. The coastal scrub hardwood and cypress types have been distributed in figure 1 between the red gum-mixed hardwood type and the cypress-tupelo gum type.

AREAS CHARACTERIZED BY THE MAJOR FOREST TYPES
SOUTH LOUISIANA DELTA

PREPARED BY FOREST SURVEY
SOUTHERN FOREST EXPERIMENT STATION
1936

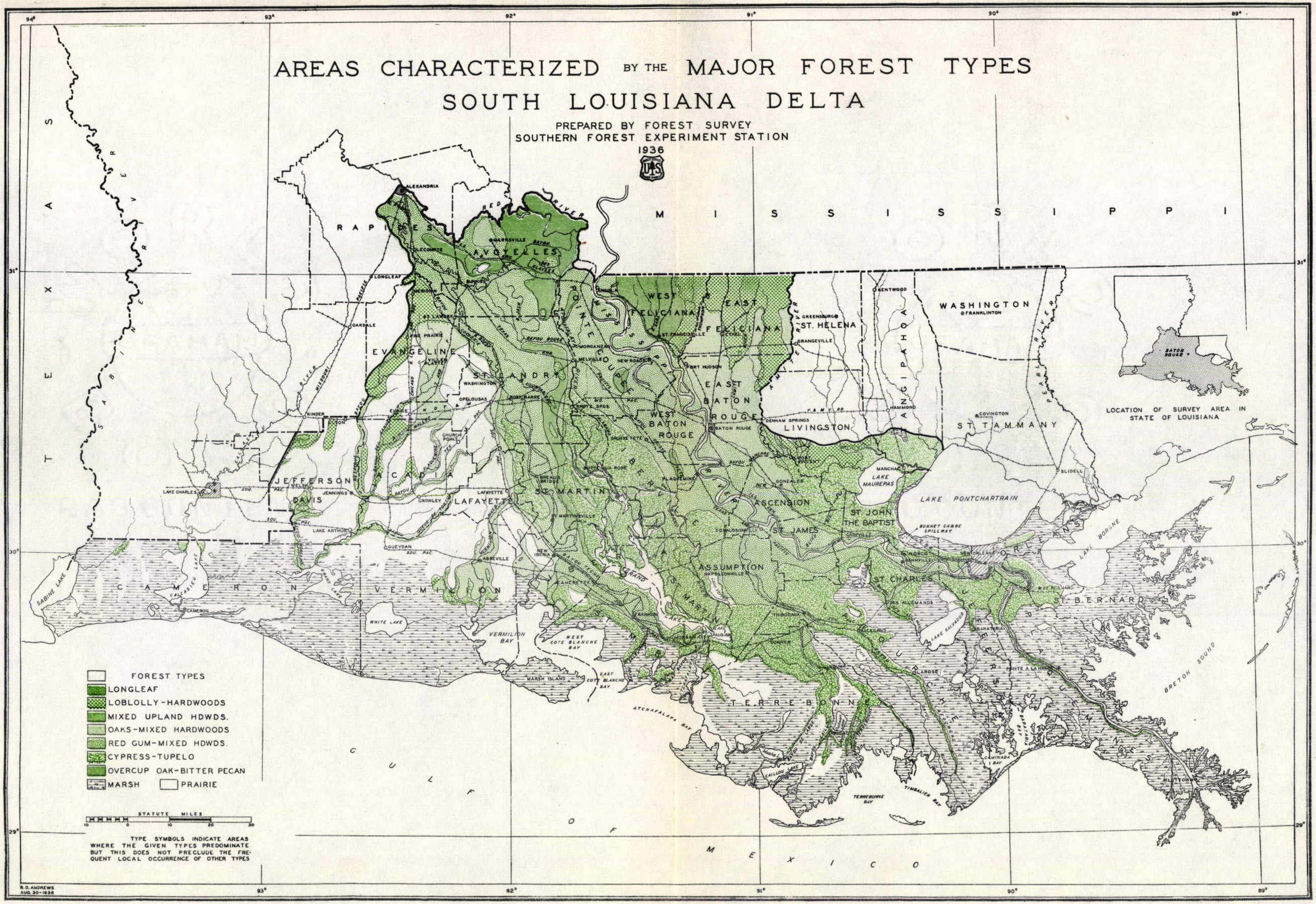

FIGURE 1- FOREST TYPE MAP.

Table 2. - Distribution of total forest area in the various forest types and forest conditions, 1935

Forest type	Old growth		Second-growth sawlog size		Second-growth under sawlog size, reproduction, and clear-cut	All conditions	
	Uncut	Partly cut	Uncut	Partly cut			
	Acres						Percent
Red gum-water oak	34,900	70,700	227,900	60,200	184,200	577,900	15.5
Hackberry-elm-ash	7,000	70,700	186,800	35,800	103,900	404,200	10.8
Overcup oak-bitter pecan	118,700	100,400	49,800	1/	80,300	350,900	9.4
Cottonwood-willow	-	-	125,700	16,600	335,200	477,500	12.8
Cypress-tupelo gum	48,900	179,000	381,500	38,400	444,300	1,092,100	29.2
Water oak	1/	19,200	56,700	16,600	15,700	109,100	2.9
Mixed oak-mixed hardwood	6,100	34,100	74,200	48,000	48,900	211,300	5.7
Pine-hardwood	14,800	6,100	155,400	54,100	84,700	315,100	8.4
Upland hardwood	1/	18,400	34,900	7,000	12,200	77,700	2.1
Scrub coastal hardwood and cypress	12,300	6,900	12,200	1/ 5300	82,900	119,600	3.2
Total	248,800	505,500	1,305,100	283,700	2/ 1,392,300	3,735,400	100.0
Percent of total	6.7	13.5	34.9	7.6	37.3	100.0	

1/ Although the Survey data show an area in this type and condition, it is too small to indicate accurately even the relative magnitude of the individual item. The area estimated, however, is carried in the total for the type and condition. equals 5300 ac about as much as some other items shown if carried on

2/ Of the area in these conditions, only about 5 percent can be classed as "clear-cut."

12300
6900
12200
82900
114300
5300
119600

The total forest area has been further subdivided on the basis of stand per acre and quality of timber into class-A areas and class-B areas. By a class-A forest area is meant one that supports a stand of adequate quality and volume per acre to warrant operation under present market conditions for such of the higher-grade products as industrial lumber, cooperage stock, or veneer. Since practically all the forest area in this unit is accessible for logging during some season of the year, throughout this report forest areas bearing 1,000 board feet or more per acre of higher-grade material are considered to be in class A. Class-B areas include all forest lands that do not meet these qualifications; some of these areas, which frequently bear stands suitable for cross ties, structural timbers, and lumber for domestic use, in time will develop through growth into class-A areas.

Material of the higher grades is contained specifically in (1) lumber-mill and veneer-mill logs and (2) other higher-quality logs suitable chiefly for the manufacture of cooperage and specialty stock. Lumber-mill logs are at least 13.6 inches (11.6 inches in ash and yellow poplar) in diameter, are at least 12 feet long, and can be expected to yield at least 30 percent of their lumber volume in grades No. 1 common and better. Logs in this class average about 60 percent of their volume in these grades of lumber. Cooperage logs and logs for specialty stock are at least 9.6 inches in diameter, at least 10 feet long, and of the same general quality as lumber-mill logs, but they cannot be so classified because of their small diameter or excessive sweep. These small logs of higher quality are suitable for industrial uses that require bolts or blocks rather than logs. In cypress and pine the higher-grade trees are those that will cut at least 80 to 90 percent of their lumber volume in grades No. 2 common and better, and that, in addition, will produce more than 5 percent in firsts and seconds or in B and better. Lower-grade material of all species is contained in logs at least 8 feet long which do not meet the above qualifications, but which are usable according to the definition on page 5. In all forest areas classified as partly cut sawlog size, the higher-grade volume is largely made up either of species that did not at the time of the last cutting have a well-established market, or of small logs suitable only for cooperage and specialty stock.

Nearly 20 percent of the total forest area, or 736,800 acres, supports sufficient higher-quality timber (1,000 board feet or more per acre) to be graded as class A. Of this class-A area, approximately 15 percent is in the old-growth uncut condition, 32 percent in the old-growth partly cut condition, 46 percent in the second-growth sawlog-size uncut condition, and 7 percent in the second-growth sawlog-size partly cut condition. Approximately 47 percent of the class-A forest area was in the cypress-tupelo gum type. Only a very small part of this, however, bears old-growth uncut timber; for the most part, it is timber land that was cut over for its merchantable cypress, leaving fair stands of tupelo gum and smaller cypress.

Forest Inventory

The volume estimate has been broken down into saw-timber volume (expressed in board feet, Doyle log scale) and into cordwood volume. The former includes the net volume of all usable logs in good trees of sawlog size, regardless of log grades. Such trees are at least 13.0 inches d.b.h. 2/ (9.0 inches in pine) and contain at least a 12-foot usable butt log (i.e., one 9.6 inches or more in diameter at the small end if hardwood and 5.6 inches or more if pine); or have at least 50 percent of their volume in material suitable for the manufacture of lumber of commercial grade, low-grade structural material, low-grade box material, or railroad cross ties. The saw-timber volume, however, includes neither the volume in cull trees nor the cull volume in good trees.

The cordwood volume of trees under sawlog size (5.0 - 12.9 inches d.b.h. in hardwood and cypress, and 5.0 - 8.9 inches in pine) includes the wood and bark of the main stem to a usable top, the minimum allowable top being never less than 4 inches and seldom more than 8. The cordwood volume is also net, that is, the volume of cull material that normally would be left in the woods as waste has not been included. In tables giving cubic-foot volumes, bark is not included in the volumes shown.

Board-foot volume

The total net board-foot volume, as shown in section I of table 3, is 6.0 billion board feet, according to the Doyle log rule. Of this total, approximately 19 percent is in old-growth uncut stands; 28 percent, in the old-growth partly cut; 43 percent, in the second-growth sawlog-size uncut; and 10 percent is in the remaining second-growth and clear-cut stands. Considering the total board-foot volume from another point of view, 55 percent (or 3.3 billion board feet), is on class-A areas; approximately 60 percent of this is of higher-grade material suitable for industrial lumber, veneers, and cooperage. On class-B forest areas, approximately 15 percent of the total board-foot volume is in the higher grades.

2/ "D.B.H." is the abbreviation for "diameter at breast height," which is the tree diameter outside bark at 4½ feet above the ground. The Survey uses 2-inch diameter-classes; thus for example, the lower and upper limits of the 14-inch diameter-class are 13.0 and 14.9 inches, respectively.

13.1 and 15.0 inches

Table 3. - Net volume of good trees on forest areas, classified (I) by forest conditions and (II) by species-groups, 1935

I. BY FOREST CONDITIONS

Forest condition and species-group	Volume on class-A areas			Volume on class-B areas			Total volume	
	Saw timber (Doyle)		Cordwood[1]	Saw timber (Doyle)		Cordwood[1]	Saw timber (Doyle)	Cordwood[1]
	In higher-grade logs	In lower-grade logs		In higher-grade logs	In lower-grade logs			
	M bd.ft.	M bd.ft.	Cords	M bd.ft.	M bd.ft.	Cords	M bd.ft.	Cords
Old growth:								
Uncut	548,200	293,600	332,200	24,600	266,800	320,800	1,133,200	653,000
Partly cut	709,200	494,400	1,255,200	79,600	385,800	907,400	1,669,000	2,162,600
Second growth:								
Sawlog size:								
Uncut	640,100	455,400	2,322,500	231,900	1,261,300	5,454,200	2,588,700	7,776,700
Partly cut	78,000	58,600	235,700	56,600	254,500	819,100	447,700	1,054,800
Under sawlog size	-	-	-	21,300	118,600	5,229,000	139,900	5,229,000
Reproduction	-	-	-	100	2,300	6,700	2,400	6,700
Clear-cut	-	-	-	100	2,200	19,200	2,300	19,200
Nonproductive	-	-	-	-	1,200	12,500	1,200	12,500
Total	1,975,500	1,302,000	4,145,600	414,200	2,292,700	12,768,900	5,984,400	16,914,500

II. BY SPECIES-GROUPS

Red gum	208,700	192,100	224,200	29,400	296,600	1,052,600	726,800	1,276,800
Water oaks	97,800	155,000	156,400	26,900	317,800	761,000	597,500	917,400
Red oaks	19,300	17,100	32,100	3,700	40,600	133,400	80,700	165,500
White oaks	15,600	26,500	39,200	9,900	60,900	80,000	112,900	119,200
Overcup oak[2]	25,500	52,600	44,700	23,300	179,100	258,300	280,500	303,000
Ash	49,800	32,400	417,600	18,900	70,100	1,449,100	171,200	1,866,700
Cottonwood	29,800	25,000	15,500	9,300	38,500	118,700	102,600	134,200
Willow	33,100	37,400	119,500	6,400	137,200	1,834,700	214,100	1,954,200
Elms[3]	35,900	50,800	132,900	22,400	147,300	474,800	256,400	607,700
Tupelo gum[4]	781,800	431,600	1,632,600	81,000	183,600	2,658,900	1,478,000	4,291,500
Cypress	219,000	68,100	594,100	71,300	83,700	1,499,600	442,100	2,093,700
Bitter pecan	38,700	54,100	79,800	17,800	248,800	550,800	359,400	630,600
Hickories[5]	7,800	17,400	32,100	6,000	44,800	93,400	76,000	125,500
Hackberry	8,700	25,700	187,700	7,800	65,300	535,900	107,500	723,600
Pines	350,100	40,900	89,000	54,000	227,900	415,000	672,900	504,000
Miscellaneous[6]	53,900	75,300	348,200	26,100	150,500	852,700	305,800	1,200,900
Total	1,975,500	1,302,000	4,145,600	414,200	2,292,700	12,768,900	5,984,400	16,914,500

1/ Cordwood volume of trees under sawlog size includes the wood and bark of the main stem to a usable top, the minimum allowable top never being less than 4 inches and seldom more than 8. Cordwood volume was calculated on a basis of 80 cubic feet per cord for hardwoods and 90 cubic feet for pines and cypress. Only woods cull was deducted from the cordwood volume.

2/ Approximately 16 percent of this volume is "hill" post oak and 1 percent is live oak.

3/ Approximately 95 percent of this volume is white elm; the remainder is cedar elm.

4/ Approximately 4 percent of this volume is black gum.

5/ Approximately 40 percent of this volume is sweet pecan.

6/ Chiefly maple, sycamore, and beech.

Although these are the total volumes, perhaps a clearer picture of the timber stands in the unit can be obtained from the following tabulation of the total average stand per acre in the various forest conditions, higher-grade and lower-grade material combined.

Forest condition	Average number of board feet per acre (Doyle log scale)
Old growth:	
Uncut	4,550
Partly cut	3,300
Second growth:	
Sawlog size:	
Uncut	1,980
Partly cut	1,580
Under sawlog size, reproduction, and clear-cut	100
Weighted average, all conditions	1,600

Since the Doyle log rule is the one most familiar to operators in Louisiana, timber-inventory volumes are shown in terms of this rule. Its application, however, to stands made up mainly of small trees results in a considerable understatement of the actual volume recoverable in lumber. The board-foot volume in this Survey unit, according to the International $\frac{1}{4}$-inch log rule, which closely approximates green lumber tally, is 8.5 billion board feet; and according to the Scribner log rule, it is 7.5 billion board feet. The average stand per acre, using the International $\frac{1}{4}$-inch rule, is 2,270 board feet instead of the 1,600 feet found with the Doyle rule. Hereafter in this report, therefore, because of the necessity of correlating drain expressed in lumber tally with volume and increment figures, the International $\frac{1}{4}$-inch rule is used to represent green lumber tally.

Cordwood volume

In addition to the cordwood volume in sound trees under sawlog size and the saw-timber volume already shown in table 3, there is, as determined by a very rough estimate, 19.6 million standard (4 x 4 x 8 feet) cords of sound wood, including bark, from the following sources:

Source	Cords
Tops and limbs of good trees of sawlog size	11,100,000
Sound wood in stems, tops, and limbs of cull trees	8,500,000
	19,600,000

In tops and limbs of sawlog-size trees, this cordwood volume includes that portion of the main stem above the usable sawlog limit and for hardwood and cypress includes in addition the limbwood over 4 inches in diameter. In cull trees, the sound volume of all stemwood in trees at least 5.0 inches d.b.h. is included, together with the limbwood in sawlog-size hardwood and cypress trees. This material is sound and usable for many uses, but only a small part is now being used. The total cordwood volume, including good trees under sawlog size, tops and limbs of sawlog-size trees, and cull trees, is 36,500,000 cords.

Cubic-foot volume

The total cubic-foot volume of sawlog material, together with the cubic-foot volume of the good trees under sawlog size and the upper stems of sawlog-size pine, constitutes the growing stock. This growing stock, which in 1935 amounted to 2.6 billion cubic feet, exclusive of bark, forms the base on which increment is calculated and from which the drain is deducted; 1.5 billion cubic feet of this was in sawlog material and 1.1 billion in trees under sawlog size. The volume in the upper stems of sawlog-size pines was negligible.

Forest Increment

The net annual forest increment is the volume added by growth to the individual trees, plus the ~~merchantable~~ volume newly created by small trees developing into merchantable sizes, and minus the losses due to mortality. This net increment represents, in a general way, the cut that can be made each year without reducing the volume of the original growing stock.

Board-foot increment, therefore, is made up of (1) the growth on trees already sawlog size and (2) the total board-foot volume of trees becoming sawlog size during the year. This increment is expressed in net log scale, and is based on good trees only, from which all cull material is excluded. Similarly, cubic-foot increment represents (1) the growth on sound stemwood in good trees at least 5.0 inches in diameter (including in sawlog-size trees only the saw-timber material), plus (2) the total volume of small trees reaching, or exceeding, a diameter of 5 inches during the year.

Table 4 shows the 1935 increment per acre in the various forest conditions in terms of board feet and cubic feet, excluding bark. In calculating these increments, deductions for natural mortality have been made; no deductions have been made, however, for material removed in cutting operations. Increment in board-foot material is expressed in green lumber tally, as measured by the International $\frac{1}{4}$-inch rule. Cubic-foot increment includes material in trees of both sawlog and under-sawlog sizes.

The average increment per acre for the entire forest approximates 100 board feet per year. On the 388,500 acres of second-growth sawlog-size class-A area, the 1935 increment averaged 209 board feet per acre.

Table 4.- Average increment[1] per acre of class-A and class-B forests by forest conditions, 1935

Forest condition	Annual increment	
	Board feet (green lumber tally 2/)	Cubic feet (i.b.)
Class-A area:		
Old growth, uncut	118	17
Old growth, partly cut	95	29
Second growth, sawlog size	209	45
Class-B area:		
Old growth, uncut	53	9
Old growth, partly cut	39	13
Second growth, sawlog size	143	36
Second growth, under sawlog size	53	34
Clear-cut and reproduction	negl.	3/-2
All conditions	98	31

1/ Figures in this table do not include increment resulting from the change of class-B areas to class-A areas (see footnote 3, table 5).
2/ Based on International $\frac{1}{4}$-inch rule.
3/ Negative increments occur when the volume lost to the stand through natural mortality of residual trees is greater than the increase in volume in good trees.

Table 5 shows the total net volume of wood added to the inventory of good trees on the whole forest area during 1935, expressed in board feet (lumber tally) for sawlog-size material and in standard cords (4 x 4 x 8 feet) for material under sawlog size. In arriving at these estimates, deductions were made for mortality but not for timber cutting. The total increment for all conditions is 366 million board feet. It is significant from the standpoint of timber utilization that of this total, 224 million board feet, or 61 percent, occurred on class-A forest areas, and that the increase in volume of trees 20 inches and larger d.b.h. was 127 million board feet. Furthermore, 42 percent of the total increment of more than a million cords on trees under sawlog size is on class-A areas. It is noteworthy that tupelo gum, which accounts for 30 to 40 percent of the increment in class-A stands, is not now widely used for lumber and also is so located that it offers small opportunity for profitable operation at this time. This volume of tupelo gum constitutes a reserve resource awaiting an effective market demand.

Table 5. - Forest increment,[1] classified according to forest condition, 1935

Forest condition	Increment[2] in trees under sawlog size			Increment in sawlog-size trees						
				Diameter-classes 14-18 inches		Diameter-classes 20 inches and over		All sawlog-size trees		
	Class-A area[3]	Class-B area	Total	Class-A area[3]	Class-B area	Class-A area[3]	Class-B area	Class-A area[3]	Class-B area	Total
	Cords			M board feet (green lumber tally)						
Old growth:										
Uncut	12,400	[4]-700	11,700	4,100	400	19,600	[3]-4,900	23,700	[3]-4,500	19,200
Partly cut	69,200	25,600	94,800	7,300	2,800	19,700	2,500	27,000	5,300	32,300
Second growth:										
Sawlog size	327,000	42,100	369,100	85,700	72,600	84,700	8,900	170,400	81,500	251,900
Under sawlog size	31,800	538,700	570,500	2,000	64,000	900	[3]-4,200	2,900	59,800	62,700
Reproduction and clear-cut	-	[4]-2,600	[4]-2,600	-	200	-	[3]-100	-	100	100
Total all conditions	440,400	603,100	1,043,500	99,100	140,000	124,900	2,200	224,000	142,200	366,200

1/ These increment figures are based on the assumption that no cutting takes place. A total increment of 356,100 M board feet is obtained when the 1935 timber cut enters into the calculation.

2/ This increment includes the annual growth on trees at least 5.0 inches d.b.h. that remain under sawlog size throughout the year, plus the volume in trees that during the year move into the 6-inch diameter-class.

3/ The annual increment on class-A forest areas includes not only the increment on areas that were class A at the beginning of the year, but also the total timber volume added through movement of areas from class B to class A as a result of 1 year's growth. A negative board-foot increment on class-B forest areas indicates (1) that the volumes on areas moving from class B to class A were greater than the increment on areas remaining in class B, and (2) that the mortality in residual stands is heavy.

4/ A negative annual increment of trees under sawlog size means that the volume of trees changing from under sawlog size to sawlog size is greater than the increment of the trees that were under sawlog size at the end of the year (see footnote 2).

Forest-Products Industries

In 1937, the South Louisiana Delta supported within its boundaries 172 forest-industry plants, of which 151 were sawmills. The location of these plants is shown in figure 2.

Lumber industry

The type of sawmill and nature of its product varies by locality within the unit. In East and West Feliciana, East Baton Rouge, and a portion of Livingston Parishes, most of the sawmills are small to medium size; they cut chiefly pine for both local and distant markets and hardwood cross ties. In the prairie portion of the unit the sawmills are almost exclusively small mills operated by farmers, cutting chiefly pine lumber for purely local farm use. Elsewhere the small farm-mills cutting scattered cypress are found in areas well developed agriculturally, while the medium-sized to large mills, cutting commercial grades of hardwood and cypress lumber for the national market, are found wherever the concentration of merchantable timber justifies operation. The chief centers for commercial forest industries in the unit are Alexandria, Plaquemine, and New Orleans.

The larger industrial lumber mills, none of which has a daily capacity of more than 80,000 board feet, generally use steam power and are of the single-band type; they are equipped to produce standard grades of well-manufactured lumber, which is usually air dried. The future of these mills depends upon their location with respect to supplies of suitable timber. Several of them unquestionably will be abandoned or moved within the next 5 to 8 years; others, especially on the Mississippi River above Donaldsonville, where water transportation of batture-grown timber is possible, can be expected to continue longer, perhaps indefinitely.

The small portable mills differ from one another chiefly with respect to kind of ownership. Some are owned by farmers and operated intermittently in connection with farming. Others are owned by commercial operators, who make a large part of their living by cutting lumber. The former use either a steam or gasoline engine for power, and their simple equipment seldom consists of more than a circular saw. These mills, most of which have a capacity of 3,000 to 6,000 board feet per day, generally operate only 10 to 25 days during the year. The commercial mills may differ very little from the farm mills, but most of them are somewhat larger and they operate a greater portion of the year.

There has recently appeared a new type of hardwood sawmill——a light, portable mill with a $4\frac{1}{2}$-foot band saw, operated by Diesel power and equipped to saw and yard standard grades of industrial lumber. At least two such mobile mills appear to be cutting successfully in the areas where the sparse residual stand of commercial-quality timber makes impracticable a large stationary plant. Owing to the cutting out of the larger mills, there is every reason to expect an increase in production from plants of this type, to fill the unsatisfied market demand for well-manufactured industrial lumber.

Guy Elder
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In table 6, which shows the production and employment data for sawmills of the unit in 1937, it is seen that these mills produced a total of 242 million board feet as compared with 199 million in 1936 and 172 million in 1935. In 1937 the timber cut from the forests of the unit for manufacturing into lumber amounted to 230 million board feet. Comparison of this figure with the 242 million board feet cut by the sawmills of the unit indicates that more logs were cut outside the unit and brought into it for sawmilling (chiefly at Alexandria, Plaquemine, and New Orleans) than were cut in the unit and shipped outside. Three plants in or near New Orleans use mahogany logs shipped from tropical countries. In addition to the sawmills in the unit, five medium-sized or large mills located outside the unit drew nearly 40 million board feet of timber in 1937 from the unit for manufacture. The 12 sawmills in the unit with a daily capacity of 40 to 79 M board feet accounted for half the lumber production. The 123 mills having a daily capacity of less than 20 M board feet cut only 14 percent of the total.

Table 6. - Production and employment data in the lumber industry, 1937[1/]

Daily capacity	Mills	Produced by mills in the unit	Mill employment	Produced from forests of the unit	Woods employment
M bd.ft.	Number	M bd.ft.	Thousand man-days	M bd.ft.	Thousand man-days
Under 20	123	33,200	49	31,800	36
20 - 39	16	87,800	166	65,700	86
40 - 79	12	121,300	270	96,700	125
80 and over[2/]	-	-	-	35,700	45
Total	151	242,300	485	229,900	292

1/ Based on a 10-hour operating day and green lumber tally.
2/ There were no mills of this class in the unit; the volume shown was cut in the unit for mills of this class outside, and the employment was that engaged in this cutting.

Nonlumber industries

Table 7 lists 21 nonlumber primary wood-using plants in the unit. Eight of these that manufacture tight and slack cooperage material and 5 that manufacture veneer, require a large proportion of higher-grade logs or bolts. In general, these plants are operating on selected residual trees cut from lands once cut-over for saw timber or from second-growth stands.

FOREST INDUSTRIES
SOUTH LOUISIANA DELTA

PREPARED BY FOREST SURVEY
SOUTHERN FOREST EXPERIMENT STATION
1937

FOREST INDUSTRIES
- SAWMILLS
- VENEER PLANTS
- COOPERAGE "
- DISTILLATION PLANTS
- TREATING PLANTS
- OTHER PLANTS

THE BD. FT. CAPACITY OF SAWMILLS PER 10-HOUR DAY IS INDICATED THUS.
1,000 - 19,000 | 20,000 - 39,000 | 40,000 & UP

STATUTE MILES
0 10 20 30

FLOODWAY LEVEE

LOUISIANA
LOCATION OF SURVEY UNIT

RAPIDES
LA FAYETTE
EVANGELINE
ST LANDRY
POINTE COUPEE
WEST FELICIANA
EAST FELICIANA
EAST BATON ROUGE
WEST BATON ROUGE
LIVINGSTON
TANGIPAHOA
ST TAMMANY
JEFFERSON DAVIS
ACADIA
ST MARTIN
IBERIA
ASCENSION
ST JAMES
ST JOHN THE BAPTIST
ST CHARLES
ORLEANS
ST BERNARD
PLAQUEMINES
ASSUMPTION
TERREBONNE
LAFOURCHE
CAMERON
VERMILION

ALEXANDRIA, MARKSVILLE, OPELOUSAS, MELVILLE, NEW ROADS, KROTZ SPRINGS, BATON ROUGE, PORT ALLEN, HAMMOND, SLIDELL, LAKE CHARLES, JENNINGS, CROWLEY, LAFAYETTE, MARTINSVILLE, NEW IBERIA, ABBEVILLE, JEANERETTE, FRANKLIN, MORGAN CITY, PLAQUEMINE, DONALDSONVILLE, THIBODAUX, NAPOLEONVILLE, EDGARD, CONVENT, NORCO, LAPLACE, NEW ORLEANS, ST BERNARD, POINTE A LA HACHE, HOLMA, CAMERON, ST FRANCISVILLE

RED RIVER, SABINE RIVER, MISSISSIPPI, LAKE PONTCHARTRAIN, LAKE MAUREPAS, LAKE BORGNE, LAKE SALVADOR, White Lake, Grand Lake, Calcasieu Lake, Sabine Lake, INTRACOASTAL WATERWAY, BONNET CARRE SPILLWAY, LOWER FLOODWAY 610,000 ACRES

GULF OF MEXICO

93° 92° 91° 90° 89° 31° 30° 29°

RDA 12-10-38

FIGURE 2 - FOREST INDUSTRIES MAP.

Table 7. - Production and employment data in the nonlumber forest industries, 1937 1/

Kind of plant or commodity	Plants in unit	Produced by plants in the unit	Plant employment	Produced from forests in the unit	Woods employment
	Number	Cords	Thousand man-days	Cords	Thousand man-days
Tight cooperage material	4	7,700	11	4,000	5
Slack cooperage material	4	17,400	34	12,800	13
		M bd.ft.		M bd.ft.	
Veneer	5	15,700	71	9,800	13
Miscellaneous 2/	8	1,600	58	800	2
		Pieces		Pieces	
Cross ties	-	-	-	182,000	21
Poles and piles	-	-	-	11,000	3
Total	21		174		57

1/ Cordwood volume is expressed in standard (4 x 4 x 8 feet) cords, including bark. Board-foot volumes are in terms of the International $\frac{1}{4}$-inch log rule. Man-days are based on a 10-hour day.

2/ Includes 2 treating plants, 2 pine destructive-distillation plants, 2 specialty plants, and 2 idle shingle mills. The production of the treating and destructive-distillation plants is not included, although the corresponding employment is.

Employment

The total forest-industry employment in the unit in 1937 was about 1,000,000 man-days (see tables 6 and 7), of which 777,000, or approximately 77 percent, were expended in the sawmill industry and the remainder in the nonlumber industries. Although it is impossible to translate these employment figures into the exact number of persons receiving either full or part-time employment in the forest industries, estimates based on the yearly production of sawmills of different sizes and of other primary forest-industry plants indicate that probably as many as 10,000 persons receive full or part-time employment in the forests and mills in this unit. Furthermore, the labor involved in cutting nearly a million cords of fuel wood and miscellaneous material used on farms, as well as the 5,400,000 fence posts used in the unit, probably amounted to approximately 1,300,000 additional man-days. Although only a small portion of this employment—possibly not more than 10 percent—was for cash wages, it represents an important employment item in the life of the people. The material thus produced, without cash outlay and usually without interference in normal gainful employment, is a substitute for material that would otherwise have to be purchased.

Forest Drain

In table 8 is shown the total volume of wood removed from the growing stock of the unit during 1937 for use in industry and for domestic purposes. This volume, termed forest drain, is the total volume of usable material removed from the growing stock by cutting; it does not include losses due to mortality, which are taken into account in calculating the increment. Neither does it include material cut from cull and dead trees or from limbs, none of which is part of the growing stock. Thus, drain in board feet in table 8 includes the volume actually used (from tables 6 and 7), plus the volume left in the woods as waste because, although it met the Survey specifications for usable material, it did not meet the requirements of the particular user or of the current market. Drain in the last column of table 8 includes the cubic-foot contents (inside bark) of the sawlog portion of sawlog-size trees, plus the cubic-foot contents of the main stem of good trees at least 5.0 inches d.b.h. but under sawlog size.

Table 8. - Net volume of timber drain from the growing stock, 1937

Commodity	From sawlog-size trees				From all trees 5 inches d.b.h. and larger
	Pines	Hardwoods	Cypress	Total	
	Thousand board feet (green lumber tally)				Thousand cubic feet (i.b.)
Lumber	32,000	155,300	54,800	242,100	39,660
Veneer	negl.	10,900	-	10,900	1,670
Tight cooperage material	-	2,700	-	2,700	410
Slack cooperage material	-	8,600	-	8,600	1,350
Poles and piles	-	100	1,400	1,500	260
Cross ties	3,400	1,600	2,800	7,800	1,490
Material used by miscellaneous industries 1/	-	800	-	800	190
Material cut in clearing land	2,000	13,400	-	15,400	3,700
Material cut for fuel wood, farm fence posts, and other domestic uses	1,400	116,800	-	118,200	33,580
Total	38,800	310,200	59,000	408,000	82,310

1/ Includes material used by two specialty plants and export logs.

The total 1937 drain from sawlog-size trees of the growing stock was 408 million board feet, of which 59 million was cypress, nearly 39 million was pine, and the remainder was hardwoods; in 1936 the drain from sawlog-size trees was about 369 million board feet, and in 1935 it was 326 million board

feet. It is estimated that about 50 to 60 percent of this drain is taken from class-A areas, which furnish a high proportion of the volume cut for lumber, veneer, and cooperage material. Class-B areas, on the other hand, furnish the greater part of the board-foot drain occasioned by land clearing, for fuel wood, and for other domestic use, since the sawlog material cut for these purposes is usually unsuited to higher-grade industrial uses.

Comparison of Increment and Drain

Timber-inventory data are based on field work done in the winter of 1934-35 and represent conditions as of Jan. 1, 1935. Subsequent changes in this growing stock caused by additions due to growth and by subtractions due to timber cutting and natural mortality were calculated as shown in table 9.

Table 9. - Changes in the growing stock

Date	Saw-timber material				All trees 5-inches d.b.h. and larger
	Hardwood	Cypress	Pine	Total	
	- - Million board feet (green lumber tally) - -				Million cubic feet (i.b.)
Jan. 1, 1935	6,854	638	996	8,488	2,608
Jan. 1, 1936	6,856	631	1,031	8,518	2,653
Jan. 1, 1937	6,830	613	1,059	8,502	2,698
Jan. 1, 1938	6,771	578	1,099	8,448	2,739

From this table we see that the total board-foot volume present Jan. 1, 1938 was practically the same as that present Jan. 1, 1935; this indicates an approximate balance of increment and drain for the 3-year period. The first year, however, when the drain was less than during the other two years, the board-foot growing stock was actually built up. All three years show a slow building up of the pine board-foot growing stock. Also the total cubic volume of the stand has been steadily increasing since 1935. A more detailed picture of the balance of growth and increment/drain is shown for 1937 in table 10.

Since 61 percent of the total net board-foot increment is on class-A forest areas, and approximately the same percent of the drain comes from them, they do not seem to be cut more severely than the forest as a whole. This situation is true even though some of the larger sawmills are facing a shortage of accessible timber of suitable species and quality. This seeming contradiction is chiefly explained by the fact that a relatively large part of the increment, especially that on class-A areas, is in tupelo gum on the less accessible lands in the swamps adjacent to Grand Lake and Lakes Pontchartrain and Maurepas. The volume on these particular areas is being built up until it reaches a quantity and value that will make it attractive to operators.

Table 10. - Comparison of increment with drain, 1937

Item	Saw-timber material				All trees 5 inches d.b.h. and larger
	Species-group			Total	
	Hardwood	Cypress	Pine		
	- - Thousand board feet (lumber tally) - -				Thousand cubic feet (i.b.)
Growing stock Jan. 1, 1937	6,829,800	612,600	1,059,100	8,501,500	2,697,620
Growth	377,900	31,800	89,000	498,700	165,850
Mortality	125,600	7,600	10,600	143,800	42,460
Percent net is of gross	67	76	88	71	75
Net increment	252,300	24,200	78,400	354,900	123,390
Commodity drain	310,200	59,000	38,800	408,000	82,310
Net change in growing stock	-57,900	-34,800	39,600	-53,100	41,080
Growing stock Jan. 1, 1938	6,771,900	577,800	1,098,700	8,448,400	2,738,700

Outlook for the Future

The outlook for the future of the forest and forest industries is, in a very real sense, conditioned by the present situation, which may be summed up as follows: Based on the record of the past 3 years (table 9), the total timber stand, as measured in cubic feet, is increasing even after deductions are made for timber cut and mortality losses, while the saw-timber component, measured in board feet, is remaining approximately constant. Of the total board-foot increment, approximately 60 percent occurs on class-A areas. Several of the larger sawmills cutting choice old-growth timber are facing a shortage of adequate timber supplies and may either have to reduce their cut or cease operation in the near future. The volume of tupelo gum, a species not now prized by industrial lumber operators, is large and forms a considerable reserve of industrial raw material, the use of which must await the development of a better market demand. The increment on this volume, which probably amounts to more than one-fourth of the total increment, contributes substantially to the approximate balance of increment and drain over the 3-year period 1935-1937.

Although this Survey unit has long been an agricultural region, perhaps never more than one-third of its area was cultivated at any one time; some areas are now being abandoned for crops, but probably a larger proportion is becoming pasture land than in other parts of the Mississippi River bottom lands. Extensive areas now in forest are entirely unsuited for agriculture and cannot be expected to be so used. Also the growth rate of the timber is rapid, and a relatively high timber yield can be sustained. Altogether, this unit will inevit-

ably continue to be an important timber producer; even the present cut-over forest has a good average volume per acre, although parts are in species not now being used commercially. Tupelo gum, the most abundant of these little-used species is suitable for the manufacture of lumber, boxes, crates, and flooring as well as certain kinds of paper pulp. With water transportation available to such manufacturing centers as Plaquemine and New Orleans, the extensive use of this and other species suitable for pulp manufacture depends chiefly upon the establishment in or near this unit of manufacturing plants using them.

The balance between board-foot increment and drain, where the margin is as small as that here, is likely to fluctuate annually from plus to minus and vice versa, depending upon the market demand. In the event of a return within the near future to what has been considered a normal demand for lumber, an over-cut can be expected. Considering, however, the possibility that several large mills may cease operation, it is not unlikely that an approximate balance between increment and drain will continue. The general application of a few simple timber-cropping practices (to be discussed later) will do much to increase this increment and thereby make possible larger future cuts. These measures are most practicable in the accessible regions where logging is already established.

In estimating the future possibilities of timber production in this unit, it must be considered in four more or less distinct subareas: (1) the pine forest, largely concentrated in East and West Feliciana, East Baton Rouge, and a portion of Livingston Parishes; (2) the prairie parishes in the southwest portion of the unit; (3) the cypress-tupelo gum swamp area adjacent to Grand Lake and Lakes Pontchartrain and Maurepas, and (4) the hardwood forest on the remainder of the area in the unit.

The pine timber stand of the parishes in the northeastern portion of the unit is growing faster than it is being used, in both cubic feet and board feet. Obviously the present cut can be maintained without over-cutting and even may be increased, especially when reduction in fire losses and improvements in management practices augment the increment still further. The pine cut, which in this territory is made largely by small to medium-sized mills, probably will continue to be made by mills of this size.

The timber stands in the prairie parishes, occurring largely in mixed pine and hardwood types along the streams but including some nearby pure pine stands, are being used to supply a number of small mills that cut lumber mainly for local farm improvements. It seems likely that the supply will continue to meet these local requirements.

The future timber possibilities of the Grand Lake swamp area—a part of subarea (3) above—and the hardwood area lying north of Krotz Springs in the floodway of the Atchafalaya River—a part of subarea (4) above—are so closely associated with the plans of the U. S. Engineer Office that a word concerning the flood-control plans of this organization is necessary in order to understand the situation.

The Atchafalaya River floodway, a levee-confined band some 15 miles wide extending southward from the Red River to the Gulf of Mexico, comprises about 760,000 acres (see fig. 2). During recent decades the amount and duration

of the annual flood waters in the cut-over cypress and tupelo gum timberland of the swamp area south of Krotz Springs gradually have increased. The Engineers do not, at this time, foresee for the immediate future any sudden or marked change in the timber-growing conditions that have prevailed during the last decade. The floodway area of about 150,000 acres north of Krotz Springs is, in the main, partially cut-over hardwood timberland. Bounded by levees, it is expected to be used as a floodway only about once a century. Here the influence of flood waters on timber growth will be practically negligible.

In the Morganza Floodway—mostly part of subarea (4) above—comprising some 57,000 acres between the Mississippi River at Morganza and the Atchafalaya River near Melville, conditions of timber management doubtless will be considerably modified from what they have been in the past. This area probably will be used to carry flood waters about once every 10 to 15 years. The U. S. Government will hold such broad easements on land and timber in this area that it virtually will control the land and timber use and the Engineers probably will not permit commercial timber cutting. If they do, it will be on a very selective basis only, as clear-cutting in a spillway stimulates the growth of cottonwood and willow, both of which, at least in the juvenile stage, retard the water flow and are consequently undesirable. On a considerable part of the spillway area, therefore, the Engineers will also wish to clear out the reproduction under 5 inches d.b.h. and the underbrush.

The U. S. Government also holds fee title to the land in the Bonnet Carre Spillway, an area of about 8,000 acres connecting the Mississippi River near Norco, La. with Lake Pontchartrain. This area of young hardwood forest has received the same treatment as is planned for the Morganza Floodway.

No easements at all are held on timber lands in the Atchafalaya floodway south of Krotz Springs, nor are any contemplated. The easements held on lands in the floodway north of this point are so drawn that the Engineers have practically no control of the timber use. As far as present law is concerned, timberland management in these two areas will be little affected by the operations of the Engineers. There is, however, no way of predicting when a change in the Federal Law may occur.

According to the present outlook, the Atchafalaya floodway area will continue to be forested, at least to the extent that it now is. Although there is agricultural land in the floodway and even some new land is being cleared north of Krotz Springs, the danger of flooding makes this land less desirable for agriculture than lands of comparable quality elsewhere.

The swamp area bordering Lakes Pontchartrain and Maurepas has been largely cut over for cypress, but it still bears substantial volumes of tupelo gum and other swamp hardwoods. Present indications are that this area will remain in timber. The hardwood forest area referred to under subarea (4), page 17, exclusive of the several floodways, can be expected to continue undiminished and probably will increase somewhat. It is from this area that will come most of the future growth of mixed oak and red gum timber in this unit.

A considerable proportion of the forest area in the unit is held by large landowners and sawmill operators. Even though these lands may not offer opportunity for income from the timber for several years, most of their owners

are holding them in expectation of oil development. A number of developed oil fields occur in the unit, and many forest owners pay their taxes with returns from oil-right options or in the expectation of such returns. The forests of this unit, therefore, can be expected to remain in private ownership as long as oil prospects are good.

The timber stands of this unit are growing on highly productive forest soils, which unlike those in other units in the Mississippi Delta, do not seem destined for future agricultural use. The opportunity for developing excellent stands of fast-growing, high-quality hardwood trees, along with the favorable location for future markets, indicates that the management of privately owned forest land for continuous crops of timber has excellent chances for success. This is particularly true in areas where income from oil leases and royalties is sufficient to help carry the cost during the period necessary to build up the forest growing stock. In view of the favorable prospects for continuous timber crops, the field for effective forest extension work ought to be better in this unit than in almost any other portion of the Mississippi Delta.

The forest land-tax situation in this unit is probably somewhat more favorable for forest production than that in other portions of the Mississippi bottom lands. In the well-settled agricultural communities, the usual state, parish, school, and road taxes average about 25 to 35 mills on the assessed valuation, which compares favorably with similar rates in other parts of the Delta. In organized drainage districts, comprising a relatively small percentage of the total forest area, drainage taxes usually amount to 20 to 35 cents per acre but may be much higher. There is, however, a large forest area in swamps and batture lands where road and school taxes are considerably less than in the agricultural communities and where there are no drainage taxes.

Among the improvements in forest practice needed in this unit are the following:

1. Increased effort in the prevention and suppression of forest fires. Even on the wettest situations, fires in the dry season (a) damage severely the standing timber, causing a loss in actual volume and reducing the grade or quality of the timber that is not destroyed, and (b) effectively prevent a stocking of the younger age-classes.

2. Improvement in the quality and composition of forest stands. Defective trees and those of low quality should be removed from all stands to make way for thrifty, young ones. This can be accomplished, in part, by taking more of the farm fuel wood, fence posts, and similar material from low-quality residual trees, from cull timber, and from thinnings rather than from sound high-quality trees.

3. The full and most economic use of the trees cut. All logs should be converted into the product for which they are best suited. This involves diversified logging, i.e., the trees to be removed from a stand are felled in one operation in which each is cut to the best advantage for sawlogs, cooperage and veneer stock, bolts, ties, etc.

These steps, if generally carried out, will do much to improve the forest for timber production and ultimately will increase the possibilities for employment and industrial income. The high growth rate and the present approximate balance between increment and drain place this unit in a very favorable position for a continuous high production of timber. The most needful forestry practices are simple and easily applied. Furthermore, the oil industry helps to carry timber land until the timber-stand improvement produces additional income through increased increment. Thus, in this unit, the prospects, on the whole, are very favorable for the development of an adequate, permanent, and dependable forest industry.